EFFECT OF LENGTH OF STORAGE OF MIXED FEED ON THE GROWTH RATE OF CHICKS

T. Tanaka
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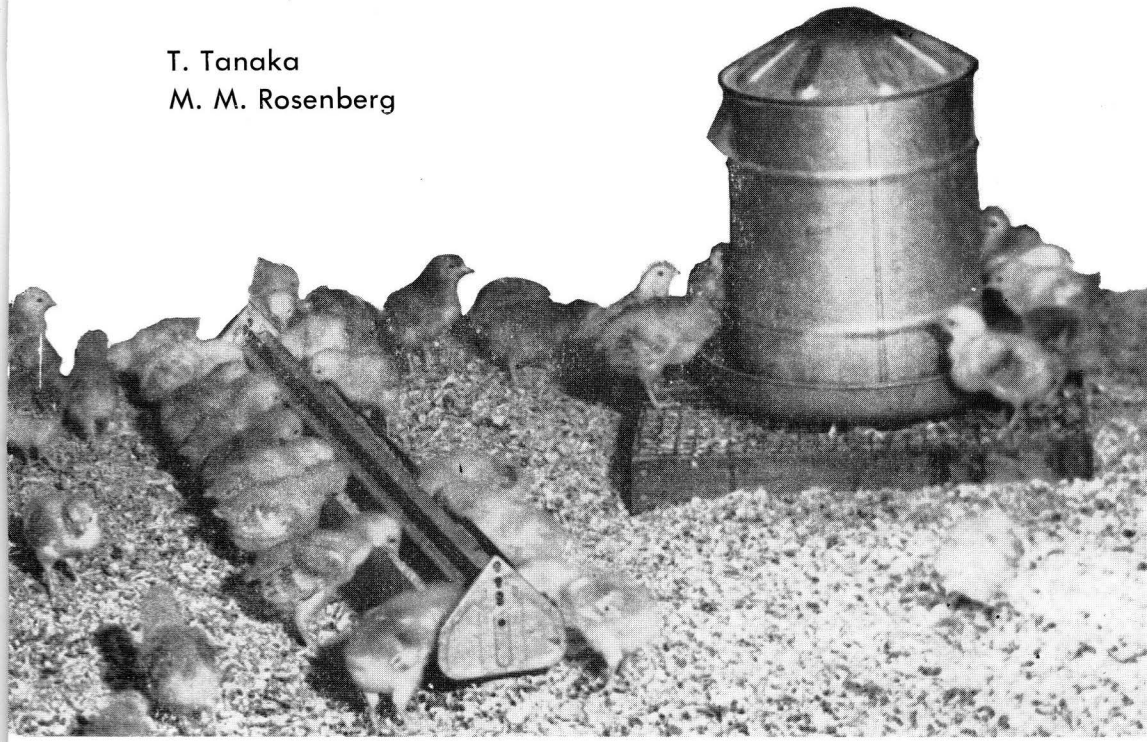

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THE AUTHORS

Mr. T. Tanaka is junior poultry scientist at the Station.

Dr. M. M. Rosenberg is poultry scientist at the Station and chairman of the University of Hawaii department of agriculture.

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T. TANAKA and M. M. ROSENBERG

INTRODUCTION

Availability of feed has been one of the most serious problems of poultry producers in Hawaii during past years. The very existence of this industry is almost entirely dependent on a steady flow of mixed feed and feed ingredients from the mainland United States and Canada. As a consequence, in times of shipping or dock strikes, the island poultry producers are faced with the very serious problem of feed shortage. Because it is generally believed that premixed feeds tend to lose their nutritive value upon storage, many poultry producers have raised the question as to the effect of length of storage of mixed feeds in Hawaii on the growth rate of chicks. This investigation was undertaken to answer this pertinent question.

MATERIALS AND METHODS

The chick starter ration shown in table 1 was mixed at the onset of this experiment and stored in a tile-walled room where daily temperature and humidity readings were obtained at 12:00 noon throughout this study. A random sample of this mixture was removed every 28 days during a period of nine trials, and the aging feed along with freshly mixed feed of the same formula were fed to two groups of 30 day-old New Hampshire chicks during a period of 6 weeks. In this way it was possible to obtain data on the effects of aging feed on individual body weights at 6 weeks of age, rate of mortality, incidence of perosis, and feed consumption. When trial 9 was begun, the aged feed was approximately 8 months old.

RESULTS

Body weight at 6 weeks

The average body weights obtained during the nine trials are presented graphically in figure 1. As may be seen, the average weight of the cockerel and pullet chicks fed freshly mixed feed remained remarkably uniform from trial to trial, indicating thereby that there was little effect of different experimental animals and feedstuffs as well as environment on the results of this study. The average weights of the control chicks fed freshly mixed feed in trial 9 was almost identical to those obtained with the original mixture fed in trial 1.

With the exception of trial 3 (second month of study), the average weights of the cockerels fed the aging feed were lighter than those fed the fresh feed (see table 2). In contrast, the pullet chicks fed the stored and fresh rations showed very similar body weights up to trial 5, but the differences in body weights were not real until trials 8 and 9. During trial 9, the cockerel and pullet

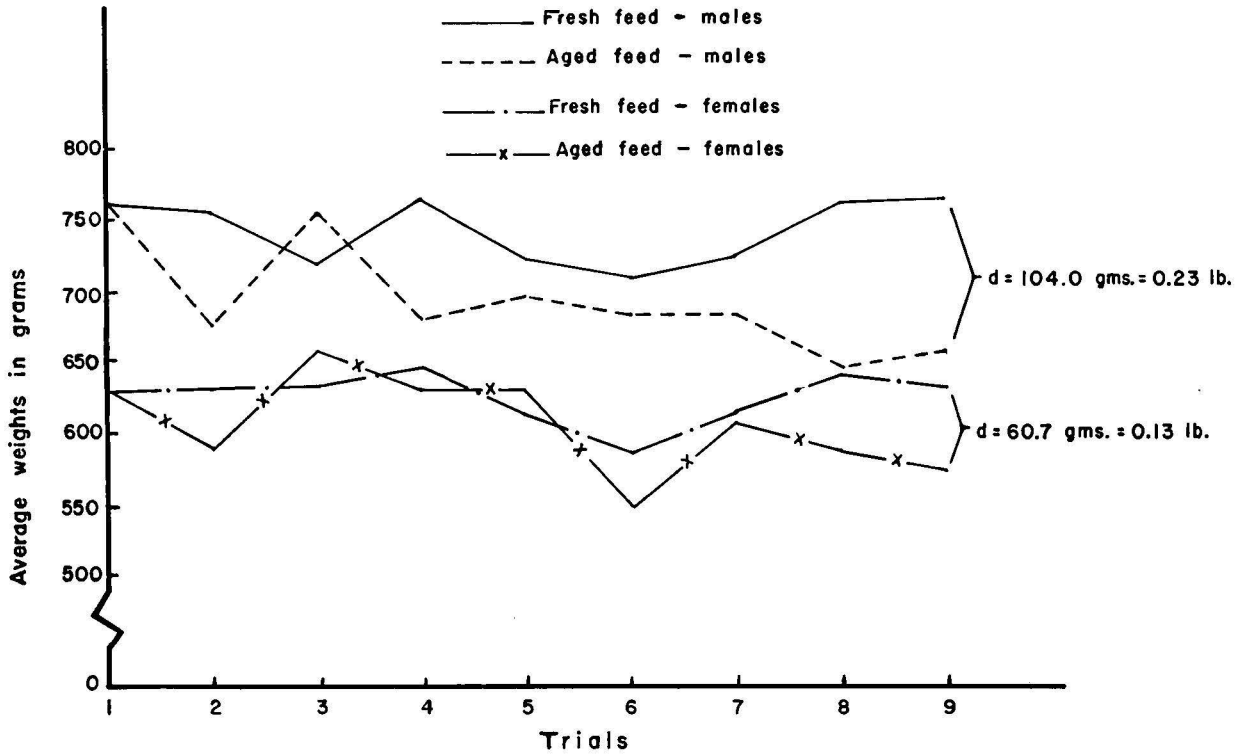

FIGURE 1. Average body weights of males and females at 6 weeks of age in nine trials.

chicks fed the aging feed were 0.23 and 0.13 pound lighter, respectively, than those fed freshly mixed feed. A statistical analysis of the data shown in table 2 revealed a significant effect of the stored ration on the growth rate of cockerels but not of pullets.

TABLE 1. Formula of experimental ration.

INGREDIENTS*	AMOUNT
Ground wheat	20.0
Ground yellow corn	30.0
Ground oats	8.25
Herring meal	5.0
Meat scrap	5.0
Soybean oil meal	26.0
Dehydrated alfalfa	5.0
Ground oyster shell	0.25
Salt	0.5
Manganese sulfate, gm.	10.0
Delsterol, gm.†	15.0
Choline chloride (25%), gm.	125.0
Riboflavin, mg.	160.0

*Unless otherwise specified, the unit of measure is pound(s).

†Delsterol contains 1500 I.C.U. of D_3 per gram.

Mortality

The mortality rates up to 6 weeks of age in each of the nine trials are summarized in table 3. In total, only 8 of 510 chicks died during this study, and of these, 6 were fed the stored feed. However, none of the chicks fed the stored feed died during trials 8 and 9.

Perosis

Perosis, commonly called slipped tendon, is a disease that may be induced by a rapid growth rate on a formula deficient in certain vitamins and minerals, by a greater deficiency of these under normal growth, or by an oversupply of either calcium or phosphorus in the chick's diet. The chick's hereditary threshold for these nutrients also plays a role in the development of this malformation. In this study, the aging feed did not influence the incidence of perosis. Strangely, as this study progressed, both males and females fed the stored feed showed a tendency toward a lower incidence than those fed the freshly mixed feed. As has been observed in many laboratories, the cockerels suffered a higher rate of perosis than did the pullets. These data are summarized in table 4.

Efficiency of feed utilization

Feed efficiency (amount of feed consumed to produce a unit of gain) was in favor of the lots fed the freshly mixed feed, except in trial 3. These differences tended to increase with the storage time. As may be seen in table 5, the chicks fed the stored feed in trial 9 required 0.46 pound more feed to produce a pound of gain than did those fed the fresh feed.

Temperature and relative humidity in storage room

In table 6 are shown the average readings obtained during each of the nine trials. The temperature range did not exceed 5° F. in any of the trials and the maximum change was only 7° F. The humidity readings tended to follow the same pattern, but the variation was much larger. The data obtained from trial 1 were recorded in November 1950, whereas the values obtained in trial 9 were recorded during August 1951.

DISCUSSION AND CONCLUSIONS

This investigation has shown that stored feed does lose some of its nutritive value even when it is stored under nearly ideal conditions. It is doubtful that feed is stored anywhere in the Hawaiian Islands under more uniform environmental conditions. Despite the fact that the feed was aged in this experiment in a climate that never exceeded 80° F., there was a progressive loss in its feeding value. By the third month of storage, cockerel chicks failed to grow as fast or use their feed as efficiently as their controls; and this loss in nutritive value and efficiency became progressively greater with each successive trial.

Interestingly, the growth rate of pullet chicks was not adversely affected until the feed had been stored for 6 months. During the first six trials, the growth rate was practically the same as those for chicks fed freshly mixed feed, although efficiency of feed utilization was adversely affected after 2 months of storage. These observations pose an interesting question! Why the difference in the results obtained for the two sexes?

It may be, by way of partial explanation, that cockerel chicks have a higher threshold requirement than pullets for the various nutrients to support their greater growth rate. Thus, as the feed aged, certain nutrients may have been diminished in quantity and quality by means of oxidation to a point inadequate for maximum growth of cockerel chicks but still adequate for pullets. Thus, as the feed aged upon storage, it became inadequate for optimum metabolism of cockerel chicks by the third month, but supported optimum metabolism among pullet chicks until it was stored for 6 months. A practical conclusion that may be drawn from this study is that it is more important, for maximum growth, to feed freshly mixed feed to cockerel chicks than to pullets. Nonetheless, this study has also shown that feed efficiency is significantly impaired after 2 months of storage. Thus, poultrymen would be well advised to insist on freshly mixed feed or special supplementation for vitamin A, at least, if the channels of trade cannot supply the farmer with feed less than 2 months from time of mixing. According to Ewing (1951), all feed ingredients tend to lose vitamin A activity with age and the rate is increased if they are ground and mixed with other feedstuffs. Antioxidants were not available at the time of this study; therefore, the extent to which the chemical changes may have been impeded by their inclusion in our experimental ration is not known. Similarly, it is not known how much faster the experimental ration might have deteriorated had it been stored under a galvanized roof in closed quarters.

TABLE 2. Average body weights of males and females fed stored or fresh feed at 6 weeks of age.

TRIALS	BODY WEIGHTS			
	Males		*Females*	
	A*	B†	A*	B†
1	760.5	760.5	625.7	625.7
2	755.2	676.1	628.1	588.1
3	718.2	755.0	633.1	658.9
4	765.2	679.3	645.4	631.4
5	723.1	695.7	615.0	629.6
6	710.0	684.1	587.3	551.1
7	752.5	685.5	614.2	610.2
8	763.1	648.2	643.8	591.6
9	769.6	665.6	635.9	575.2

*Fresh feed.
†Old feed.

TABLE 3. Rate of mortality to 6 weeks of age of chicks fed stored or fresh feed.

TRIALS	PERCENT DEAD	
	A*	B†
1	0.0	0.0
2	0.0	3.3
3	0.0	6.7
4	3.3	0.0
5	0.0	0.0
6	0.0	6.7
7	0.0	3.3
8	3.3	0.0
9	0.0	0.0

*Fresh feed.
†Old feed.

TABLE 4. Incidence of perosis at 6 weeks of age in chicks fed stored or fresh feed.

TRIALS	INCIDENCE OF PEROSIS (percent)			
	Males		*Females*	
	A*	B†	A*	B†
1	7.7	7.7	5.9	5.9
2	0.0	8.3	0.0	7.7
3	7.7	0.0	0.0	0.0
4	14.3	21.4	6.7	0.0
5	18.8	11.8	0.0	0.0
6	21.0	0.0	0.0	0.0
7	25.0	8.3	5.6	0.0
8	18.8	5.6	7.7	0.0
9	18.8	18.2	0.0	0.0

*Fresh feed.
†Old feed.

TABLE 5. Feed efficiency of chicks fed stored or fresh feed for 6 weeks.

TRIALS	FEED EFFICIENCY* (pounds)	
	A†	B‡
1	2.41	2.41
2	1.98	2.13
3	2.20	2.16
4	2.38	2.48
5	2.09	2.44
6	2.05	2.36
7	2.10	2.49
8	2.20	2.51
9	2.45	2.91

*Sexes combined.
†Fresh feed.
‡Old feed.

TABLE 6. Temperature and relative humidity readings recorded during the investigation.

TRIALS	TEMPERATURE RANGE*	RELATIVE HUMIDITY RANGE†
1	73.0–78.0	69.4–74.7
2	73.0–77.0	66.2–81.6
3	73.0–76.0	69.6–87.4
4	73.0–76.0	81.6–91.2
5	74.0–77.0	82.2–91.4
6	75.0–79.0	70.8–91.8
7	77.0–80.0	70.8–91.8
8	80.0–80.0	75.0–92.0
9	80.0–80.0	75.0–92.0

*Expressed in degrees Fahrenheit.
†Expressed in percent.

SUMMARY

1. A chick starter ration, adequate for growth, was stored for a period of 9 months in a uniform environment that never exceeded 80° F. A random sample of this feed was compared with freshly mixed feed of the same formula at intervals of 28 days during a series of nine trials.

2. The growth rate to 6 weeks of age of cockerel and pullet chicks fed the freshly mixed feed was remarkably uniform during the nine trials. In comparison, cockerel chicks grow significantly slower when fed the aged ration after the feed has been stored for more than 2 months. The pullet chicks grew as well as their controls until the stored feed had been aged for 6 months.

3. The efficiency of the stored feed was adversely affected after 2 months of storage. At each trial conducted thereafter, the ration stored for more than 2 months was less efficient than the freshly mixed control.

4. Aging of feed, under the conditions of this experiment, did not affect the incidence of perosis or mortality.

5. An explanation of the difference in results between the two sexes was suggested.

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UNIVERSITY OF HAWAII
COLLEGE OF AGRICULTURE
HAWAII AGRICULTURAL EXPERIMENT STATION
HONOLULU, HAWAII

Paul S. Bachman
President of the University

H. A. Wadsworth
Dean of the College and
Director of the Experiment Station